**리뷰논문**

**OD와 MED**

William Mixter and Joseph Barr는 1934년에 최초로 외상성, 퇴행성 디스크 탈출과 요통, 하지 방사통과의 연관성에 대해 설명했고 lumbar discectomy에 대한 자세한 내용을 발표했다[[1](#_ENREF_1)]. 그들의 수술법은 수 십년에 걸쳐 수정되었고 1977년과 1978년에 Yasargil [[2](#_ENREF_2)], Caspar [[3](#_ENREF_3)], Williams [[4](#_ENREF_4)] 가 discectomy시 디스크 탈출 부분에 해당하는 등쪽 절개 후 수술용 현미경을 이용한 microsurgical techniques에 대해 기술하였다. 그 후 이 수술법들에 대한 약간의 수정은 있었으나, 이 수술법들에서 별로 큰 변화는 없었다.

가장 최근 lumbar discectomy의 변화는 microendoscope의 도입이다. Schreiber and Suezawa [[5](#_ENREF_5)] 와

Mayer and Brock [[6](#_ENREF_6)]가 기반을 만들었고 그것을 토대로 Foley and Smith [[7](#_ENREF_7)] 는 1997년에 microendoscopic discectomy system을 소개했다. 그것은 수술용 현미경을 사용하지 않고 보다 더 작은 절개 후 microendoscope을 삽입해서 증상성 신경근 감압을 하는 최소 침습적 수술적 접근이다. Lumbar microdiscectomy에서는 paraspinous muscles을 spinous processes와 lamina에서 떼어내서 바깥쪽으로 당겨야 한다. 하지만 microendoscopic procedure에서는 paraspinous muscle을 spinous processes에서 떼지 않는다. 대신 접근에 필요한 수술 기구들 모두가 paraspinous muscles 섬유들 사이로 접근한다. 이 술기의 ‘‘muscle splitting’’접근은 근육에 더 적은 손상을 주고 수술 후 기간 동안 절개로 인한 통증을 더 적게 유발하는 것으로 생각된다[[8](#_ENREF_8)]. 그 후 1999년에 METRx (Medtronic Sofamor Danek, Inc., Memphis, TN)라 불리는 2세대 MED system이 만들어졌다 [[9](#_ENREF_9)]. 경피적 접근과 달리 METRx system에서는 포함된 탈출 디스크를 알 수 있을 뿐만 아니라 분리된 디스크 조각과 lateral recess stenosis도 알 수 있다. Microendoscope을 쓰는 방법은 아직 널리 선택되지는 않지만, 수술 결과가 lumbar microdiscectomy에 비견할 만하다는 최근의 보고들에 따라 점점 더 관심받고 있다[[8](#_ENREF_8)].

**고찰**

지금까지 발표된 많은 논문들을 보면[[9](#_ENREF_9), [10](#_ENREF_10), [11](#_ENREF_11), [12](#_ENREF_12), [13](#_ENREF_13), [14](#_ENREF_14)], ED가 OD보다 수술 시간이 짧고 국소 마취가 가능하며 더 적은 절개로 수술 후 진통제 사용량이 적고 입원 시간이 짧다고 하나 두 수술법 간의 수술 후 증상 완화 정도에는 통계적으로 유의한 차이가 없고 합병증의 발생 정도와 재발율에도 논란이 있다. 또한 많은 논문들이 적은 환자수로 연구를 진행하여 통계적으로 무의미한 결과를 도출했다.

**결론**

많은 연구들에서 유의한 차이가 없었던 ED, OD의 수술 후 증상 완화 정도에 대한 보다 더 정확한 비교가 필요하며 두 수술법 간의 장단점에 대한 확실한 평가가 필요하다. 또한 논란이 되고 있는 합병증의 발생 정도와 재발율에 대해서도 보다 더 정확한 연구가 필요하다.

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**수술 과정**

**Lumbar microdiscectomy**

The patient is placed in the prone position after

intubation. Lower extremity sequential compression

devices are applied for deep vein thrombosis

prophylaxis. The patient is positioned with the

abdomen hanging freely in order to avoid increased

intraabdominal pressure. This prevents epidural

venous congestion and troublesome bleeding which

can obscure the surgeon’s operative field (8). The

arms, which are placed abducted on armboards,

must be well padded to avoid brachial plexus or

ulnar nerve injury. Pressure on the eyes must be

avoided as a prolonged increase in intraocular

pressure can cause blindness (9).

The level to be operated on is first approximated

by palpating the sacrum and using the iliac crests to

roughly estimate the L4-L5 interspace. A spinal

needle is then placed into an interspace and an x-ray

is taken to identify the spinal level. The incision is

then made with a knife over the correct interspace.

Monopolar electrocautery is used to divide the

subcutaneous tissues. This exposes the lumbodorsal

fascia. The fascia is incised in a slightly arcuate

manner in order to preserve the interspinous

ligaments. The paraspinous muscles are then

detached from the spinous processes, laminae, and

the medial facet. Care must be taken to maintain the

dissection in the subperiosteal plane to avoid

bleeding and undue trauma to the muscles. This is

done with a sharp periosteal elevator and monopolar

electrocautery. A sponge can then be guided over the

bony surfaces with the periosteal elevator to clean

any residual muscle left on the lamina. Remaining

muscle obscuring the ligamentum flavum can be

removed with a Leksell or pituitary rongeur. The

inferior aspect of the superior lamina, the medial

facet, and the superior aspect of the inferior lamina

are all thinned using a high-speed drill and/or Leksell

and Kerrison rongeurs.

The next goal of the operation is to remove the

ligamentum flavum and gain access to the epidural

space, which can be done in one of three ways:

* The ligamentum flavum can be detached from the

undersurface of the rostral lamina and then be

removed in a superior to inferior manner.

* It can be detached from the rostral end of the

inferior lamina and be removed in an inferior to

superior manner.

* The fibers can be cut and further separated with a

small dissector such as a Penfield 4 in a longitudinal

fashion and subsequently be removed

with Kerrison punches.

All three methods will reveal the epidural space.

At this point in time, the dura of the thecal sac and

the nerve root that is compressed by the herniated

disc are identified. Occasionally epidural fat will

obscure these structures. This fat should be removed

with a pituitary rongeurs or shrunk back with bipolar

forceps. The nerve root can be gently mobilized

medially to reveal the disc space and the overlying

epidural veins. The veins must be coagulated with

bipolar forceps and cut with fine microscissors.

Blunt nerve hooks, down-angled curettes, and

Penfield dissectors can be used to mobilize free disc

fragments that can then be removed with pituitary

rongeurs. With the nerve root protected medially by

a nerve root retractor or a blunt suction tip, the

posterior longitudinal ligament is inspected. If it is

healed over and no further disc fragments are

encountered, the operation is completed. When an

opening in the posterior longitudinal ligament is

encountered, the opening is incised and disc material

from the disc space can be extracted using the

instruments previously mentioned. It is important to

put the pituitary instrument in the disc space no

further than approximately 2.5 cm to avoid penetrating

the anterior longitudinal ligament. Traction

or penetrating this ligament can lead to catastrophic

injury to the great vessels.

The nerve root and its foramen are gently palpated

with microdissectors to assure the surgeon that the

nerve root is adequately decompressed. After

hemostasis is achieved, the fascia, subcutaneous

tissue, and skin are closed in standard fashion. Steri-

Strips are then applied to the skin.

**Microendoscopic lumbar discectomy**

The same positioning principles are applied as

described in the previous section. An operative bed

must be used that will allow intraoperative lateral

fluoroscopy, which is required for this procedure.

The METRx system (Medtronic Sofamor Danek,

Memphis, TN, USA), which has a tubular retractor

system, is used. An incision is made approximately

1.5 cm off the midline, using a spinal needle for

localization as in the previous section. A k-wire is

advanced through the fascia and between the fibers

of the paraspinous muscles under fluoroscopic

guidance toward the junction of the rostral lamina

and the medial facet. This wire must not plunge into

the interlaminar space in order to avoid dural tear or

nerve root injury (10). A small initial dilator is placed

over the K-wire and is swept in a medial-lateral

direction to sweep the muscle off the laminae.

Sequentially larger dilators are placed over the first

dilator. Once the final tubular retractor is placed

over the largest dilator, a lateral fluoroscopic image

is repeated to ensure that the surgeon is working at

the correct spinal level. The microendoscope is then

attached to the tubular retractor. The video cart that

displays the image from the microendoscope must

be placed across from the surgeon so that he/she can

work in a comfortable fashion. The remaining bone

removal, ligamentum flavectomy, identification of

the nerve root, and discectomy are all performed in

the same manner as described in the previous section

on lumbar microdiscectomy but with endoscopic

visualization rather than microscopic.

**OD와 MED 비교 표**

**Table 1. Comparisons of Perioperative Parameters Between MED and Open Groups**

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| --- | --- | --- | --- | --- |
| Wu X 등 [[9](#_ENREF_9)] |  | OD  (N = 358) | MED  (N =873) | *P* |
|  | Hospital stay (days) | 7.3 | 4.8 | <0.05 |
|  | Blood loss (mL) | 135 | 44 | <0.001 |
|  | Mean time to return  to work (days) | 21 | 15 | <0.05 |
|  | Operative time (min) | 66 | 56 | >0.1 |
|  | The use of analgesic | 157 | 132 | <0.005 |
|  | Complications | 35 | 19 | >0.05 |
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**Table 2. Preoperative and Follow-up Assessment**

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| Wu X 등  [[9](#_ENREF_9)] |  | MED | | | | Open | | | |
|  | Preoperative | Postoperative | *P* |  | | Preoperative | Postoperative | *P* |
| VAS | 78 | 23 | <0.005 |  | | 72 | 26 | <0.005 |
| ODI (%) | 48 | 23 | <0.005 |  | | 52 | 21 | <0.005 |
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